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with Professor Downing, and conversed on guns, &c., in April or May, 1855.

The third shows the design in accordance with which the mortars were completed subsequently to the bankruptcy of the first contractor in December, 1855, and in which Mr. Mallet reverted fully to the principle of the original design; and having in the interval had his ideas on the subject of construction with initial tension enlarged and made exact by the mathematical investigations communicated to him by Dr. Hart, 6th July, 1855, was enabled to develop the principle completely in both the chase and chamber, by constructing both in several successive plies extended and compressed.

A. S. Hart, LL. D., Professor Jellet, and Rev. S. Haughton, made some remarks on Mr. Mallett's and Captain Blakely's communications.

The Academy then adjourned.

MONDAY, NOVEMBER 12, 1860.

JAMES HENTHORN TODD, D. D., President, in the Chair.

MR HENNESSY, F. R. S., read a paper—

ON A THEOREM RELATING TO CONICAL SURFACES.

THE Theorem is announced as follows:—"If a cone of maximum volume, under a given conical surface, roll on a plane with its vertex constantly touching a point in the plane, the interior envelope of the cone will be a second cone which possesses the property of containing a maximum volume under its total surface."

If we denote by  $\theta_1$  the angle at the summit of the cone of maximum volume under conical surface, and by  $\theta_2$  the corresponding angle for the cone of maximum volume under total surface, we shall have

$$\sin \frac{1}{2} \theta_1 = \frac{r_1}{l_1}, \quad \sin \frac{1}{2} \theta_2 = \frac{r_2}{l_2},$$

$r_1, r_2$ , being the respective radii of the bases, and  $l_1, l_2$ , the respective slant heights of the cones.

By the usual methods we easily find

$$r_1 = \frac{1}{\sqrt{3}} l, \quad r_2 = \frac{1}{3} l.$$

Whence

$$\sin \theta_1 = \frac{2\sqrt{2}}{3} \quad \cos \frac{1}{2} \theta_2 = \frac{2\sqrt{2}}{3}$$

Consequently, if  $\beta$  represent the angle at base of the cone of maximum volume under total surface, we shall have

$$\sin \theta_1 = \sin \beta.$$

The angle at the summit of the cone of maximum volume under its conical surface is, therefore, equal to the angle at the base of the cone of maximum volume under its total surface, and the theorem announced immediately follows. It also readily appears that upon the same base the cone of maximum volume under total surface is double that of maximum volume under conical surface.

Rev. William Reeves, D. D., read the first part of a paper "On the Ancient Order of Culdees in Ireland."

ROBERT M'DONNELL, M. D., read a paper—

ON THE ORGANS WHICH IN THE COMMON RAY ARE HOMOLOGOUS WITH THE ELECTRICAL ORGANS OF THE TORPEDO.

THE very beautiful structures which exist in the electric as well as the non-electric rays, as appendages of the anterior branches of the fifth pair of nerves, were regarded by Geoffroy St. Hilaire and others as the representatives of the electric organs of the torpedo. The fact, however, of their existence in the torpedo along with, although not united with, the electric organs, is sufficient to render this view untenable.

1. Savi, who has given an accurate description of them in the torpedo, as well as a beautiful drawing, considers them as an apparatus for the secreting of mucus. For reasons, however, not to be entered on at present, the view taken by Jacobson, Treviranus, and, more recently, by Leydig, that these are organs of sensation, seems the correct one.

2. The existence of the true so-called "system of the lateral line" in the electric, as well as the non-electric fishes, enables us also to set aside this apparatus as not being homologically related to the electric organs, as has been supposed by some authors.

3. The organ described by its discoverer, Dr. Stark, of Edinburgh, as an electrical apparatus, in the tail of the flapper skate and other rays, on account of its form and position, can hardly be considered the true homologue of the electric organ of the torpedo; nor am I aware that any of the authors who have examined it have, in their subsequent researches concerning this tail-organ, put forth such a notion. Possibly the pseudo-electric tail-organs of the rays may yet be shown to be homologically related to the electric organs of the *Gymnotus electricus*.

I believe, however, that I have lately discovered in the non-electric rays the organs which are the true homologues of the batteries of the torpedo; and it is the object of the present communication to indicate the anatomical relations of these organs, and briefly to state how I have been led to make them out.

If the skin be carefully removed from the upper surface of the head